

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Progeny LMS, LLC (“Progeny”)	)	DA 11-446
Waiver Request filed March 8, 2011	)	WT Docket No 11-49

To: Office of the Secretary  
Attn: Chief, Wireless Telecommunications Bureau

**Further Comments in Opposition**

Skybridge Spectrum Foundation and Telesaurus Holdings GB LLC and other undersigned entities (together “Petitioners”) submit these further comments.

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**(i) Initial Remarks**

Progeny appears to interpret current rules for its undisclosed purpose. Petitioners do not comment on its interpretation but responds to its Petition as presented. Progeny is capable technically and legally to present a clear case if it wants to, and to present an assessment of current rules based upon their actual explicit meaning taken together, and as further shown in the FCC rulemaking Orders, such as the assumption of separation between M-LMS and Part 15

device systems due to the former serving transportation traffic and the latter serving more localized areas and non-vehicular applications. What is clear is the FCC created M-LMS and allocated the considerable spectrum for it, to serve expected future ITS needs where GPS would not be sufficient including, as the FCC wrote, since it did provide for two-way communication essential for ITS. Progeny's proposal clearly is to remove its M-LMS spectrum from ITS applications of any significance and viability. That should be summarily rejected. See also Exhibit 4.

#### 1 Technical deficiencies, but indicated major problems

See Petitioners Comments which are augmented by Exhibit 1 below. This was drafted by several persons including a wireless engineer experienced in the 902-928 MHz band. The engineer was not available for final review at this time, but will be able to do that soon, and at that time the same Exhibit, but with possible changes and the identification of the engineer will be filed on ULS.

#### 2 Discussion of appropriate technology and systems in this shared band

See Exhibits 2 and 3 hereto.

Exhibit 2 is a paper commissioned by and in collaboration with Petitioners. This was prepared soon after Petitioners first obtained M-LMS licenses, as part of a joint study with Metricom Richochet senior engineers. This paper is presented here not to represent Petitioners currently planned technology but to show certain principals. The paper explains the huge difference (giving some quantification) in performance when in this shared band certain smart technology is used. This will also benefit other users in the band.

The study's first phase was to consider and simulate what is now called cognitive radio, or dynamic spectrum access radio, in 902-928 MHz using active cooperation between M-LMS and Part 15 networks, and also passive interference reduction techniques.

These are far more feasible and cost effective to achieve today. If there ever was a band that called for these techniques it is 902-928 MHz. This should not be seen as an obstacle but as what will eventually be needed in all major bands suitable for mobile and very wide area wireless. The combination of wide-area ITS wireless focused in time and space on vehicular transport routes and traffic, and unlicensed devices generally in other space and time, each with substantial flexibility for viable primary services without fully real time QoS, provides an excellent basis for cooperative exploitation of this band to fully utilize it in time and space, and to be a pioneer for other bands. This calls for full disclosure and cooperation in the public interest not vague proposals using unsupported claims as Progeny proposes.

Exhibit 3 discusses dynamic spectrum access at this time (in later 2010) and the work that remains. It discusses Meteor Burst Communication (“MBC”) as an existing example of technology and systems that, by the nature of meteor burst events, requires use of dynamic spectrum access. Petitioners have placed noted on this paper and also posted it here:

<http://www.scribd.com/doc/52643386/Dynamic-Spectrum-Access-and-Meteor-Burst-Communications>

In this regard, LMS and MBC have been recognized as two important wireless services for ITS by ITS authorities. See the papers here, which contain notes by Petitioners:

[http://www.scribd.com/warren\\_havens/shelf](http://www.scribd.com/warren_havens/shelf) Under this link see sublinks:

<http://www.scribd.com/collections/2618807/Meteor-Burst-Communications-MBC-Systems-US-and-Earth> Under this link scroll down to the papers on MBC and LMS for ITS.

### 3 The proposed waivers would remove the spectrum from ITS uses

As Exhibit 1 discusses, the proposed waivers if granted would remove the spectrum from ITS uses. ITS requires two-way communications. The vehicles will have to very often report their location and the status of the vehicle and occupants to the network, and get from the ITS network location-based and other critical instructions and information. One-way service will not

be ITS wireless, regardless of whether multilateration is performed on the down- or up- link or both. That removal is clearly Progeny's intent and it should be rejected.

4. LMS is not a commercial profit-based service

The FCC was clear in that M-LMS is for expected future ITS, and core ITS applications must be provided in association with government transportation authorities. The focus must be on ITS safety and efficiency not profit. Petitioner have structured their holdings of M-LMS to secure this and demonstrate it: a large part (2 MHz) assigned irrevocable to Skybridge Spectrum Foundation, a nonprofit, and the rest dedicated to this Foundation for defined phase 1 uses, which are these ITS safety and efficiency uses.

See Exhibit 4 including underlined and highlighted text. M-LMS was eventually established to allow for-profit service to help subsidize its use for ITS, and the expansion to permit the current flexible ITS uses was limited to vehicle services as primary. That should be maintained, and for profit services allowed on this basis only.

5. The great need for LMS for ITS, based on HALO

See Petitioners Comments. See Exhibit 5: a draft final report from the University of California. Since this is not final, it should not be circulated.

6. The waiver request entirely fails the tests under §1.925

As shown in our Comments and above (and in exhibits), there is no way to meet waiver standards where the results of the waivers if granted cannot be shown, or even asserted, in comparison to results based on proceeding under current rules. Progeny does not commence any such showing. Progeny asserts no reason it cannot comply with current rules.

[Execution on next page.]

Respectfully submitted,

**Skybridge Spectrum Foundation**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**Telesaurus Holdings GB LLC**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**Environmental LLC (formerly known as AMTS Consortium LLC)**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**Verde Systems LLC (formerly known as Telesaurus VPC LLC)**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**Intelligent Transportation & Monitoring Wireless LLC**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**V2G LLC**, by  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens, President

**Warren Havens**, an Individual  
[\*\[Filed electronically. Signature on file.\]\*](#)  
Warren Havens

Each Petitioner:

2509 Stuart Street  
Berkeley, CA 94705  
Phone: 510-841-2220`  
Fax: 510-740-3412

Start of  
April 11, 2011

Exhibit

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**San Francisco, California.**  
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**Comments on the  
Waiver Request by Progeny LMS, LLC  
in FCC WT Docket 11-49**

These comments are prepared for and provided to Warren Havens for Skybridge Spectrum Foundation and Telesaurus Holdings GB LLC to submit to the FCC in the above captioned matter.

I am a wireless engineer with 10 years experience designing wireless systems for the 902-928MHz unlicensed band. My resume (not fully updated) is attached below.

I am responding to the waiver request by Progeny LMS, LLC dated March 8, 2011. Mr. Havens and I have common contacts at the University of California, Berkeley in wireless technology and systems field. We have conducted joint investigation of wireless technology and systems for use in 902-928 MHz for location-based applications, both under Multilateration LMS ("M-LMS") licenses and on an unlicensed Part 15 basis. I have developed certain technology to augment the range and reliability for use of this and other spectrum for various purposes, including location of vehicles and other moving things.

In my opinion, the waiver request is too vague to understand the effect that technology and systems under the proposed waived rules, verses the current rules, would have on unlicensed devices and systems of unlicensed devices operating in the 902-928MHz band, as well as to determine the impact upon wireless Intelligent Transportation Systems ("ITS") using M-LMS spectrum operating under the current rules (with no waivers). The likely effect is adverse. Below I give examples.

Page 14 paragraph 3 states that the public interest would be served by granting Progeny's request because Progeny's approach would greatly reduce the potential for interference to Part 15 devices operating in the M-LMS spectrum. The argument is that since Progeny's technology is broadcast only and not two way, this would reduce interference. This argument is flawed since even a broadcast only technology can cause as much or more interference to Part 15 devices than two-way service.

To understand the effect of the interference, Progeny would have to provide information about the transmitter antenna height, transmitter effective output power, power control,

transmitter placement and density, transmit time and duty cycle, signal bandwidth and spectrum mask of their proposed transmit signal, “cognitive” or “dynamic spectrum access” technologies used, if any, etc. [Example]

In addition to a detailed transmitter deployment plan, Progeny should provide a detailed spectrum mask of their proposed signal so that other M-LMS operators can better understand the adjacent channel interference effects.

I understand the issue here is that Progeny claims its vaguely described technology and systems will improve upon what is possible under current rules: technical and/ or public-interest improvements, but that is only possible by presenting details and simulation (or real life test) results of what is proposed vs. what is required and permitted under the current rules.

Broadcast generally assumes transmitters at high height and the higher end of permitted ERP. Since part 15 devices are low power devices, a high power broadcast only technology can still cause significant co-channel as well as adjacent channel interference to part 15 unlicensed devices operating within the same band. This may also adversely affect adjacent-channel M-LMS systems operating under the current rules, for example, if the broadcast-only system uses higher transmit heights vs. the two-way M-LMS systems on adjacent spectrum optimized for traffic capacity and reliability.

Page 11 paragraph 4 states that the public interest would be served since Progeny’s positioning technologies are significantly more accurate and reliable than existing services, particularly in challenging environments such as indoors and urban canyons. Progeny however has not provided information to be able to make such a bold claim. Indoor environments pose significant challenges including multipath and severe signal attenuation. Furthermore, interference from other unlicensed users in the 902-928 MHz band, which concentrates in and near buildings, can significantly degrade the positioning accuracy and even make positioning impossible. Although today’s GPS technology does not work indoors beyond limited degrees, it does use licensed spectrum which makes it very reliable in outdoor environments (but with varying accuracy due to multipath, satellite blockage, and other causes if not augmented and corrected). Furthermore, coupling GPS technology together with low cost inertial measurement units can allow GPS technology to provide accurate positioning even in indoor environments.

Progeny should provide detailed simulation results to back up their claims, such as to demonstrate that they can provide reliable and accurate positioning in indoor environments with significant multipath. As their request stands, it lacks the fundamental technical information

needed to assess if its vaguely described proposed technology and systems may improve upon what can be provided under the current rules, for ITS or other permitted applications.

Progeny's proposal for a one way broadcast technology for M-LMS would limit the benefit of the M-LMS band for ITS networks. An ITS network must be able to probe vehicles for their status and locations periodically, receive responses, deliver location-based and other critical instructions and data, and conduct other two-way communications. This can only be done reliably using a dedicated 2 way channels between vehicle and base stations such as provided for under the current M-LMS rules (as opposed, e.g., to using commercial wireless for the return paths). For example, vehicles that are involved in an accident should be able to immediately and automatically report their locations and the severity of the accident to first responders. Section 90.155(e) states that an M-LMS network must be able to interrogate a mobile for these critically important ITS and safety purposes.

Pursuant to Section 90.353(g), M-LMS operators are permitted to provide location service to non-vehicular devices only on an ancillary basis. Progeny requests a waiver on this rule so that they have no obligation to serve vehicles. However, considering only technical ramifications, this could significantly increase the interference to other users of the 902-928MHz band. This is due to the fact that to provide services to non-vehicular devices would require a much higher density of transmitters in the areas those other devices are most used: away from roadways and generally in and around buildings. This is especially true in indoor environments where there is significant signal attenuation. In addition, by moving from roadway vehicle services to other services, the peak hour of use will shift and this is likely to coincide more with unlicensed use, since it is not for roadway vehicle service.

While Progeny's waiver proposal is vague, the principals would increase competition in spectrum use in space and time with unlicensed use, as compared to vehicle ITS services under the current rules. Again, without technical details and network simulation showings noted above, what Progeny has in mind and the results of it cannot be understood, including the interference effect on co-channel unlicensed users and adjacent-channel unlicensed and other M-LMS licensed users.

An additional problem with granting a waiver of Section 90.353(g) is that it could have an adverse impact on other M-LMS network operators. A dense network of high height broadcast transmitters of sufficient power and density to provide indoor services as Progeny proposes could cause adjacent channel interference to sensitive M-LMS receivers operating in nearby channels, especially if they use spectrum efficient higher orders of modulation and a



higher density of fixed transceivers to provide two-way wireless services to vehicular traffic at busy hour.

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Exhibit 4  
(Exhibits 2 and 3 are separately uploaded)

Excerpts (emphasis added) from:

In the matter of Amendment of Part 90 of the Commission's Rules to Adopt  
Regulations for Automatic Vehicle Monitoring Systems

PR Docket No. 93-61

**RELEASE-NUMBER:** FCC 95-41

FEDERAL COMMUNICATIONS COMMISSION

10 FCC Rcd 4695; 1995 FCC LEXIS 763; 77 Rad. Reg. 2d (P & F) 84

February 6, 1995 Released; Adopted February 3, 1995

22. Commenters also express diverse views on whether **[\*\*27]** LMS licensees should be allowed to provide **for-profit service**. SBMS and Southern California Gas Company (SCG) support offering multilateration LMS as a subscriber-based private radio service. n53 MobileVision also supports permitting LMS licensees to provide services to paying subscribers, stating that such licensing "recognizes the massive capital cost incumbent in deploying the type of extensive infrastructure required for an LMS system of appropriate scope and scale to effectively serve a market." n54 On the other hand, the American Radio Relay League (ARRL) and the Part 15 Coalition oppose allowing multilateration LMS licensees to provide subscriber-based service. n55

n53 See Comments of SBMS dated June 29, 1993, at 4; and Comments of SGC dated June 29, 1993, at 2-3 ("private carrier" support, but outside of 902-928 MHz).

n54 MobileVision Comments dated June 29, 1993, at 40-41.

n55 See Comments of ARRL dated June 29, 1993, at 11-12; and Comments of the Part 15 Coalition at 16.

23. We recognize the concerns of the Part 15 and amateur communities that the expansion of permissible uses of the LMS service will result in more intensive use of the 902 - 928 MHz band. Unfettered **[\*\*28]** interconnection and messaging in the LMS could not only increase the potential for harmful interference to other users of the band, but detract from the intended purpose of the LMS allocation. Based on these concerns, we conclude that while a limited expansion of potential applications of LMS is warranted, operational restrictions should be imposed to maintain the coexistence of the many varied users of the band. We find therefore that it is appropriate to impose: 1) limitations on the provision of non-vehicular location services; 2) restrictions on messaging services and interconnection and; 3) a prohibition against message and data transmissions to fixed units and units for which location and monitoring is not being provided. We believe that these restrictions strike an equitable balance between the needs of LMS service providers and those of the Part 15 users and manufacturers and amateur operators, and additionally ensure that LMS systems are utilized primarily for location service and not as a general messaging or interconnected voice or data service. To ensure compliance with these

restrictions, we may request, and licensees shall supply, whatever records or information **[\*\*29]** necessary to demonstrate that these provisions are being followed.

24. Accordingly, we will allow non-vehicular location services to be rendered only by multilateration LMS systems whose primary operations involve the provision of vehicle location services. This limited expansion of permissible LMS uses recognizes the general capability of multilateration systems to cover a wide area and perform location determinations for any type of object within that area. We believe that non-multilateration systems, however, should continue to be used for vehicle monitoring only because the **[\*4709]** spectrum they occupy has a heavier concentration of amateur radio operators, Part 15 devices and Federal Government radiolocation operations than other portions of the band. We are concerned that permitting non-multilateration systems to provide this additional service will cause more intensive use of the sub-band, to the detriment of these other users.

25. While we expand the potential applications of LMS as described above, we decline to allow LMS to be used for the type of messaging proposed by Southwestern Bell. We agree with numerous commenters who argue that creating such a broad messaging **[\*\*30]** and data service would be an inappropriate use of this spectrum. n56 The LMS service is a mobile location and monitoring service. We do not intend to expand use of this band so that it becomes primarily a fixed, point-to-multipoint or point-to-point messaging service. Our rules make adequate provision elsewhere for this type of communications. n57 The 902-928 MHz band, however, is the only allocation for location services that provides sufficient spectrum to accommodate the types of advanced location and monitoring systems currently being implemented. Although there are other methods and spectrum available to determine the location of a unit, these other methods do not offer the same capabilities or potential as systems developed in the 902-928 MHz band. n58

n56 TIA comments at 6; Interdigital comments at 3; Alarm Industry comments at 7; Ademco comments at 4; Consumer Electronics Group of the Electronic Industry Association (EIA/CEG) comments at 5; and Proxim, Inc. (Proxim) comments at 3. Uniplex notes that the NPRM requires that messages be related to the unit being located but urges that tighter restrictions be placed on messages, Uniplex comments at 3.

n57 See generally, Parts 21 and 94 of our Rules, 47 C.F.R. Part 21 and 94.

n58 See para. 18, *supra*.

**[\*\*31]**

26. We do not intend for this service to be used for general messaging purposes. Accordingly, we will require that all messaging be associated with the location or monitoring of the vehicle or unit. We will permit communications necessary to provide accurate, timely and complete status and instructional information relating to the vehicle being located or the occupant(s) of the vehicle, including voice communications. Thus, LMS systems will be permitted to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system. We find that such use of LMS will be invaluable to the implementation of ITS of the future. n59

n59 Both IVHS America and DOT emphasized the need for sufficient communications capacity to implement ITS services, including Advanced Traffic Management Systems, Advanced Traveler Information Systems, Advanced Vehicle Control Systems, Commercial Vehicle Operations, and Advanced Public Transportation Systems. See

comments of IVHS America and DOT. See also Strategic Plan for Intelligent Vehicle Highway Systems in the United States, prepared by IVHS America. Implementation of such an array of ITS services will require substantial communications capacity and a combination of various technologies to provide sufficient location and traffic management information in many different circumstances.

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[\*4710] 27. In addition, we will permit limited LMS interconnection. n60 We will permit "store and forward" interconnection, where either (1) transmissions from a vehicle or object being monitored are stored by the LMS provider for later transmission over the PSN, or (2) transmissions received by the LMS provider from the PSN are stored for later transmission to the vehicle or object being monitored. We will not permit real-time interconnection between vehicles or objects being monitored and the PSN, except for emergency communications related to a vehicle or a passenger in a vehicle. n61 Additionally, the vehicle or object being monitored may only send or receive real-time interconnected communications to or from entities eligible in the Public Safety or Special Emergency Radio Services n62 or a system dispatch point. Finally, the requirement discussed above that all messages be associated with the location or monitoring of the vehicle continues to apply. We believe these limitations on interconnection will serve to impede the proliferation of interconnected voice and data communications by LMS systems while also providing them the flexibility to better serve the subscribers [\*\*33] to the service. n63

n60 We note that Part 15 devices performing functions similar or identical to those of licensed LMS operations are not restricted from interconnecting with the PSN.

n61 Emergency communications may include information about a medical condition that requires immediate attention or the mechanical breakdown or failure of an automobile.

n62 See 47 C.F.R. Part 90, Subparts B and C. This would also permit "911" interconnection where this service is available.

n63 See Ex Parte Comments of MobileVision dated December 14, 1994, at 5-6.

28. Finally, we find it in the public interest to allow LMS licensees to make service available to individuals and the Federal Government in addition to Part 90 eligibles. This step will effectively enable LMS operators to serve all members of the public, thus increasing the potential for the public to benefit from the expansion of ITS services. In addition, because many LMS systems will entail construction of extensive infrastructure over wide geographic areas, we also find it in the public interest to permit LMS to be offered to paying subscribers. By permitting LMS offerings to be structured as commercial subscriber-based [\*\*34] service, we afford licensees a realistic means of underwriting system development.